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AUTHORITY

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STEP

AUTHOR: Karpenko, G. V.

TITLE: Some concepts in the theory of the effect of liquid metals upon the mechanical properties of solid (structural) metals

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva i avtomatyky, L'viv. Nauchnyye zapiski. Seriya mashinovedeniya. v. 9, 1962, Voprosy mashinovedeniya i prochnosti v mashinostroyenii. no. 8, 5 - 10

TEXT: Liquid metals can change the mechanical properties of solid metals in the following manner: 1) by reducing the surface energy level of the solid metal during the absorption of the liquid metal (the Rehbinder effect). This effect, which can be of a plasticizing or embrittling nature, depends on the intensity of the surface energy reduction and whether the reduction occurs on the surface or inside the solid metal; it depends moreover on the magnitude of stress, predetermining the failure. 2) By the dissolving of solid metal by liquid metal, caused by the heterogeneity of the solid metal; this effect is the same as that of stress concentrators which reduce toughness, endurance and

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fatigue strength. However, M. I. Chayevskiy has observed the contrary effect, namely that the mechanical characteristics can be improved by the effect of liquid metal, in case when the solid metals already possess stress concentrators. 3) By the formation of a new solid metal, as a result of a solid solution formed during the penetration of liquid metal atoms in the solid metal lattice. These transformations depend on the properties of the new substances and on their effect upon the appearance of compressive or tensile stresses in the surface-adjacent layer of the solid metal. If there are compressive stresses, endurance and fatigue strength are increased, and vice versa. 4) By the formation of a new solid metal, as a result of the chemical interaction of the solid and liquid metals. The author points, in particular, to the heterogeneity of the solid metals and the presence of defects in them, which entail a selective effect of the liquid metals upon considerable volumes of the solid metal. It is pointed out that deformations of the solid metal activate the effect of liquid upon solid metals.

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